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Control of black spot; peas, potatoes, lettuce

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EXPERIMENTAL SUMMARIES 1984

Crop	Trial number	Title	Status
Peas	84MT49	Control of black spot	Completed
Potatoes	84PE25	Varietal susceptibility - Powdery scab	Completed
	84MD46	Varietal susceptibility to soft rot *Erwinia*	Completed
	84PE31	Yield loss and disease damage of potatoes due to *Erwinia* species	Aborted
	84MD37) 84PE32) 84PE33)	Incidence of soft rot *Erwinia* in potato/cauliflower rotations	Completed
	84MN31	Yield loss and disease damage of potatoes due to *Erwinia* species	Continuing
	84MN32	Varietal susceptibility to soft rot *Erwinia*	Continuing
	84MN33	Incidence of soft rot *Erwinia* in potato crops	Continuing
Lettuce	84MD35,37-51	Varietal susceptibility to dry leaf spot (d.L.s.)	Completed
	84MD36,52	Importance of seed-borne inoculum to disease development (d.L.s.)	Completed
	84MD72	Control of dry leaf spot of lettuce with copper sprays	Completed
	84MD73	Effect of crop rotation on dry leaf spot	Continuing
	84MD70	Varietal susceptibility to dry leaf spot	Continuing
	84MD71	Importance of seed-borne inoculum to disease development (d.L.s.)	Completed
	84MD76	Yield loss of lettuce due to dry leaf spot	Completed
	84MD77	Persistance of *Xanthamonas campestris* pv. *vitians* in soil	Aborted

Please find attached summaries for all experiments completed as at February 1, 1985.

Eleanor M. Carter

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Plant Pathologist

84MT49 Control of black spot of peas

INTRODUCTION

Black spot (Ascochyta complex) is considered to be a problem in processing pea crops in the Kendenup area. Fungicides used as seed treatments and as foliar sprays can provide disease control but the relationship between disease damage and yield loss is not clear. An experiment was conducted at the Mt Barker research station to test the efficacy of fungicides in controlling seed-borne infection and to establish loss of yield in plots infected compared to plots protected with foliar fungicide sprays.

MATERIALS AND METHODS

The experiment was planted on a site which had not recently been planted to peas. Plots 3.4 x 20 m were used, each plot separated by 3.4 x 20 m plots of dwarf oats or by herbicide sprayed areas. (The seeding rate used was 100 kg/ha). Treatments were arranged in a split plot design as follows:

Main treatments - foliar sprays

1. No fungicide sprays
2. Benomyl (150 g a.i./ha) at fortnightly intervals from 8 weeks after emergence*.
3. Carbendazim (150 g a.i./ha) at fortnightly intervals from 8 weeks after emergence.

Sub-plot treatments - seed dusts 2 g/kg seed

1. No treatment
2. Benlate/Thiram ("P - Pickel")
3. Benlate/Apron 1:1
4. Benlate
5. Delcene

* Approximately at flowering; shown previously to be a critical phase for infection. Maximum of six sprays per plot.

Plots were inoculated soon after planting with two bales of pea hay infected with Mycosphaerella pinodes, scattered evenly over the whole area to ensure disease development. All plots were scored for emergence, for disease levels at stages of crop growth, and assessed for yield at harvest.

Disease score system:

1. Stems: + or - incidence.

2. Plants divided into 3 equal portions and rated as follows for foliage damage:

0	no apparent symptoms
0.5	< 1% of leaf area affected
1	< % leaf area affected < 5
2	5-10% leaf area affected
3	11-25% leaf area affected
4	26-50% leaf area affected
5	> 50% leaf area affected.

3. Presence or absence of Septoria blotch and downy mildew also recorded.

RESULTS

No significant differences between treatments were detected for emergence counts, any of the disease assessments, or yield assessments. The conclusion is that foliar sprays of benomyl or carbendazim will not control black spot in a high disease inoculum situation. It is extremely questionable if foliar sprays would be considered an economic alternative in anything other than a high disease situation. Due to nil control of black spot no inferences on yield loss can be made. As the experiment was inoculated with *M. pinodes* post-emergence and there were no significant differences between sub plot treatments in emergence no relevant assessment of seed treatment efficacy can be made. However, seed treatment is seen as the only viable use of fungicides for control of blackspot of peas.

84PE25 Potatoes - Varietal susceptibility to powdery scab

INTRODUCTION

Powdery scab continues to be a problem in winter-grown potato crops in light sandy soils in the metropolitan growing region. The disease also occurs sporadically in all other potato-growing areas in Western Australia. As no information was available on the relative susceptibility of many of the currently grown commercial varieties and some varieties close to commercial release, an experiment was conducted to screen all available varieties.

MATERIALS AND METHODS

A severely infested site at Jandakot with a crop rotation of potatoes (winter crop) followed by cauliflowers (summer crop) was chosen. The soil type was light sand (pH 5.4 approximately), the area used had not been recently treated with fungicides and had been quite uniformly infested with the powdery scab organism (*Spongospora subterranea*) in the previous season. Eighteen potato varieties were planted in a randomised block design with three replications, using all of the available seed. Most of the varieties had been grown at the Manjimup Research Station, a few varieties were grown at Albany. However, seed maturity was as uniform as possible. The experiment was managed as for the growers crop; the centre 4 m of each 5 m plot row was harvested as soon as all of the varieties had matured. Each plot was graded according to size into 2 categories, less than 70 g and greater than 70 g, then the greater than 70 g category was graded for powdery scab lesions as follows:-

Nil - no lesions detected
Light - less than 5% of total surface area affected
Medium/heavy - more than 5% of total surface area affected.

Until recently the nil and light category would all have been considered as grade 1 and hence marketable yield. However, grading regulations are being reviewed and there may be a price penalty for the "light" category.

RESULTS AND DISCUSSION

Table 1. Potato Variety Yields

Potato Variety	Mean Yields kg/plot Gross	< 70g	Nil	Light	Medium/ Heavy	Marketable Yield (tonnes/ha)
Bremer	20.87	2.71	14.60	3.17	0.00	29.6
Cadima	11.67	1.73	9.60	0.37	0.00	16.6
Cambou	13.77	3.28	9.87	0.46	0.00	17.2
Coliban	14.37	1.47	7.76	4.42	0.47	20.3
Delaware	17.03	3.25	10.10	2.85	0.67	21.6
Exton	19.80	3.61	14.83	0.53	0.00	25.6
Geographe	20.00	2.51	8.38	6.01	2.57	24.0
Greta	18.23	6.74	11.12	0.37	0.00	19.1
Kennebec	14.85	1.87	10.53	1.47	0.41	19.9
Netted Gem	11.13	5.41	4.98	0.11	0.00	8.5
Nooksack	12.83	1.02	10.65	0.95	0.00	19.3
Norland	14.57	4.24	9.45	0.59	0.16	16.7
Pontiac	17.53	4.33	10.18	2.56	0.24	21.2
Sebago	18.23	3.36	12.27	2.03	0.33	23.8
Up-to-date	16.50	5.14	9.25	2.07	0.21	18.9
8120/5	11.43	5.83	4.76	0.37	0.03	8.5
84-3 x 33-1	11.60	6.15	5.07	0.24	0.00	8.8
5117	14.37	5.74	4.23	2.93	1.26	11.9
5% L.S.D	3.640	1.395	2.125	1.918	0.909	
c.v.	13.6%	21.3%	27.9%	63.6%	149.7	

Significant differences were detected between varieties in each grading category ($P < 0.01$). Some of the russetted varieties which are traditionally considered to have some resistance to *Spongospora subterranea*, i.e. Netted Gem and Norland had quite low marketable yields but this was the result largely of a high proportion of undersized tubers produced under the growing conditions experienced. The breeding lines 84-3 x 33-1 and 5117 also had a high proportion of undersized tubers but low levels of powdery scab.

There were several varieties which produced higher gross and marketable yields than the standard Delaware, including Sebago, Geographe, Bremer and Exton (Figure 1). Of these Bremer and Geographe are two varieties which are close to commercial release. Exton is a variety also rated as having low susceptibility to powdery scab by the Victorian Department of Agriculture. From these results it would appear that the new varieties which may be released will not be a high powdery scab risk.

LETTUCE DRY LEAF SPOT EXPERIMENTAL SERIES 1984-85

INTRODUCTION

Dry leaf spot of lettuce (causal organism Xanthomonas campestris pv vitians) was first recorded in Western Australia in 1983. There is very little literature on the ecology of the bacteria or the epidemiology of the disease. The following series of experiments was conducted to collect preliminary data on the disease and examine possible control measures.

84MD35,47-51 Varietal susceptibility to Xanthomonas campestris pv vitians

AIM

To establish if any of the commercially available lettuce varieties available for autumn/winter plantings possess disease resistance.

MATERIALS AND METHODS

Six successive plantings of lettuce were grown at Medina Vegetable Research Station according to department recommendations. The first four plantings were inoculated with X. campestris pv vitians by incorporating 3.5 kg of infected lettuce leaves per 75 m^2 area. The final two plantings were inoculated by spraying young lettuce seedlings with a 10^7 cells/ml suspension of three different isolates of the bacterium (due to the unavailability of suitable diseased leaf material). Each planting was assessed for disease one week after thinning and at harvest. Pesticides were used where necessary to control insects and fungal diseases.

Lettuce were harvested at the time when most heads were at optimum maturity. In the earliest plantings Cabrillo had not formed a heart at harvest whereas in the later plantings Winterlake did not form a heart.

Disease scoring systems used, based on visible leaf surface area.

(i) For first planting

0 - no apparent symptoms
1 - less than 10% of lower leaves infected
2 - up to 50% of lower leaves infected
3 - lower leaves severely infected (> 50%)
4 - heads affected.

(ii) For subsequent plantings

Each plant was divided into
- lower leaves
- inner wrapper leaves and head.

Scoring system of each part:-

Score		Percentage of leaf area lesioned
0 -	no apparent symptoms	
1 -	negligible	less than 10%
2 -	light	11 - 25%
3 -	moderate	26 - 50%
4 -	severe	> 50%

Scores of individual lettuces for each plot were measured to give a mean disease score.

RESULTS AND DISCUSSION

There were significant differences in disease levels between varieties at some planting times but no consistent trends were apparent (Table 2). Winterlake had significantly lower disease scores than all other varieites at the earlier plantings only. The value of separating plants into inner and outer portions to improve accuracy of scoring seems questionable. An even simpler score based essentially on disease incidence may be most appropriate for any future experiments, i.e. nil disease, trace, diseased, as even plants with 10% of lower leaves infected could be considered unmarketable, particularly for export markets where even a very low level of disease can develop into a problem during storage and transport.

Table 2. Differences between lettuce varieties in development of dry leaf spot.

Variety M.S.D.

Planting time - week of	Mean disease score for:-	1. Winter-lake	2. Supa-green	3. Sali-nas	4. Cab-rillo	5. Black Velvet	6. Hender-son's Pride	L.S.D	
84MD35 1. 14/5	Whole plant	1.46	2.03	2.11	1.87	2.14	2.31	0.507	***
84MD47 2. 28/5	inner	0.87	0.59	0.68	0.58	0.89	0.80	0.490	N.S
	outer	1.74	2.13	1.89	2.24	2.44	2.70	0.829	*
	inner + outer	1.30	1.37	1.25	1.38	1.32	1.58	0.715	N.S
84MD48 3. 11/6	inner	0.67	0.58	0.43	0.74	0.70	0.55	0.361	N.S
	outer	1.08	1.44	1.31	1.37	1.52	1.41	0.352	*
	inner + outer	0.86	1.00	0.91	1.04	1.11	0.99	0.183	**
84MD49 4. 25/6	inner	0.56	0.46	0.25	0.49	0.45	0.45	0.331	N.S
	outer	1.67	1.13	1.03	1.03	1.14	1.02	0.146	*
	inner + outer	0.82	0.80	0.64	0.76	0.79	0.73	0.214	N.S
84MD50 5. 9/7	inner	0.27	0.16	0.16	0.48	0.21	0.22	0.262	**
	outer	1.00	1.00	1.02	1.03	1.00	1.02	0.062	N.S
	inner + outer	0.63	0.58	0.59	0.76	0.60	0.62	0.138	**
84MD51 6. 23/7	inner	0.10	0.10	0.09	0.19	0.10	0.07	0.148	N.S
	outer	1.00	1.00	1.00	1.00	1.00	1.00	-	N.S
	inner + outer	0.55	0.55	0.53	0.59	0.55	0.54	0.079	N.S

84MD36,52 Importance of seed-borne inoculum to development of lettuce dry leaf spot.

AIM

To establish if seed-borne *X. campestris* pv *vitians* is important in initiating a disease epidemic.

MATERIALS AND METHODS

Two experiments were planted, managed, harvested and assessed in the same way as at Medina Vegetable Research Station. However one site had not previously had any lettuce planted on it, while the other site had had a lettuce experiment severely infected with black spot in the previous winter season.

Lettuce seed of the variety Winterlake was tested and found to have no infection with *X. campestris* pv *vitians*. A quantity of this seed was then artificially infected by soaking until the seed was thoroughly wet (approx 30 mins) in a 10^7 cells/ml suspension of 3 strains of the bacterium, drying under sterile conditions and planting the following day. The inoculated seed was mixed with clean seed to give the various treatment percentage infections on a weight basis. Both experiments were hand-planted to minimise thinning required.

RESULTS AND DISCUSSION

As disease development occurred very late in the life of the crop and was not severe plants were assessed on a whole plant basis, but on the 0-4 scale. No significant differences were detected between mean disease scores of any treatments at either site. This implies either that there was no influence of seed-borne inoculum on disease or that the method of seed inoculation was not efficient.

84MD72 Control of dry leaf spot of lettuce with copper sprays.

AIM

To establish if the foliar use of copper provided control of dry leaf spot and/or caused phytotoxicity.

MATERIALS AND METHODS

A lettuce crop was grown and inoculated as for 84MD35 and a series of nine treatments was arranged in a randomised block design on the crop. A disease assessment was made at harvest and sub samples of each treatment were taken for analysis of levels of copper, manganese, zinc, sodium and chloride.

Treatments were as follows:-

1. No copper sprays
2. Weekly sprays of copper
3. Three sprays of copper, at weekly intervals
4. Three sprays of copper, at weekly intervals from five weeks after planting.
5. Fortnightly sprays of copper
6. Copper + mancozeb (premixed) sprayed weekly
7. Three sprays of copper + mancozeb (premixed) at weekly intervals

8. Three sprays of copper + mancozeb (premixed) at weekly intervals from five weeks after planting
9. Fortnightly sprays of copper and mancozeb (premixed).

Note: Sprays from thinning onwards unless otherwise specified.

RESULTS AND DISCUSSION

No significant differences were detected between treatments for mean disease levels. Results of element analysis are not yet available. Foliar copper is not considered to give control of dry leaf spot.

84MD71 Importance of seed-born inoculum to development of dry leaf spot.

AIM

To establish if high levels of seed-borne inoculum could institute a disease epidemic.

MATERIALS AND METHODS

This experiment was conducted as for 84MD36 and 84MD52 on a site not previously planted with lettuce. The differences in this experiment were the lettuce variety (Cabrillo), the time of planting and high proportions of infected seed.

RESULTS AND DISCUSSION

Significant differences were detected between treatment mean disease scores in this experiment, however the pattern of differences is confusing (Table 3).

Table 3. Mean disease levels of treatments

Treatment		Mean Disease Score
1.	0% seed infected	0.96 bc
2.	0.1% " "	0.89 c
3.	1% " "	0.78 d
4.	10% " "	0.94 bc
5.	50% " "	1.04 b
6.	100% " "	1.18 a

5% L.S.D. = 0.107.

One hundred percentage of seed being inoculated did produce significantly higher disease levels than all other treatments, however all other levels of seed-borne inoculum did not cause levels of disease any higher than no seed-borne inoculum. The source of disease in the untreated plots is assumed to be workers and machinery as there was no obvious spread of disease between plots.

84MD76 Yield loss of lettuce due to dry leaf spot.

AIM

To establish the amount of yield loss possible due to dry leaf spot.

MATERIALS AND METHODS

A lettuce crop (variety Cabrillo) was grown at Medina Vegetable Research Station according to department recommendations and half was inoculated just after thinning and after a further seven days with a 10^7 cells/ml mixture of three strains of X. campestris pv vitians. Uninoculated plots were 1.5 x 12 m and superimposed on a randomised block design on the crop. The crop was harvested when the maximum number of heads were at maturity, scored for disease on a whole plant basis using a scale of 0-4, and weighed.

RESULTS AND DISCUSSION

All plots were infected with dry leaf spot to some extent. Differences in levels of disease between inoculated and uninoculated treatments were significant, i.e. disease levels were higher in the inoculated treatment (MDS = 1.52) than the uninoculated treatment (1.10). Most plants would have been unmarketable due to leaf damage, there was no significant difference between the treatments in harvested weight. Disease assessments could, in future, be based solely on disease incidence as this is the determining factor of marketability.

POTATOES - SOFT ROT ERWINIA EXPERIMENTS 1984

84MD46 Varietal susceptibility of potatoes to soft rot Erwinia spp.

AIM

To assess the susceptibility of a range of commercial and breeding line potatoes to infection with soft rot Erwinia bacteria.

MATERIALS AND METHODS

Twenty seven potato varieties were cut, as is commercial practice, to two eyes per seed piece and inoculated with Erwinia bacteria. One culture of each of Erwinia carotovora ssp atroseptica and E. carotovora ssp carotovora were chosen on the basis of a tuber pathogenicity test. The two bacterial isolates were grown for 24 hrs on a low nutrient medium then prepared as a mixed suspension of 10^6 cells/ml. This suspension was inoculated into seed pieces by stabbing each piece twice with the eye of a darning needle dipped in the suspension (approx volume 0.01 ml each time) immediately before planting.

The experiment was planted as a randomised block design with each plot consisting of a 5 m row. The crop was grown according to departmental recommendations and assessed for disease several times throughout the life of the crop. At maturity the crop was harvested, graded, weighed and assessed for incidence of blackleg in daughter tubers.

RESULTS AND DISCUSSION

There were large differences in emergence between varieties. Plants which did not emerge were dug up to confirm that blackleg was the cause of poor emergence. Differences were statistically significant.

Some of the most promising new commercial varieites emerged well under severe disease pressure, e.g. Bremer, Geographe, 84-3 x 33-1, Wanseon x Tasman. Of the few varieties grown in W.A. the "processing varieties" generally were in the moderate range of disease susceptibility, whereas Delaware, the mainstay of the W.A. potato industry performed very poorly (Figure 2).

Differences in plant numbers during crop growth were also significant. Small numbers of plants died during crop growth, and a proportion of plants developed disease symptoms (usually stem soft rot, occasionally blackleg) but did not die. The breeding line 84-3x33-1 had particularly high levels of stem soft rot during the season.

Differences between both gross and marketable yields of varieties were statistically significant. Generally yields reflected the same pattern as the mean emergence values, and some of the variability would be due to the yielding capacities of different varieties (Figure 3). The newer variety Bremer out-yielded all other varieties whereas varieties such as Pontiac ad Kennebec had similar yields. Potatoes were graded into marketable, over and undersize and reject categories, however no blackleg was observed in daughter tubers.

This experiment proved to be a useful test for susceptibility of varieties to soft rot *Erwinia* but would have been more useful if there had been sufficient seed for inoculated and uninoculated treatments of each variety and if a field environment more conducive to disease could be maintained.

Table 4. Response of potato varieties to infection with soft rot *Erwinia* species.

Variety	Mean emergence (plant numbers/plot row	Marketable yield (kg/plot row)
1. Abanaki	19.33	12.22
2. Alamo	4.67	0.62
3. Bremer	28.00	19.75
4. Cadima	3.67	2.20
5. Caribou	14.00	3.31
6. Coliban	17.33	3.85
7. Delaware	4.00	1.72
8. Exton	17.33	6.61
9. Fundu	17.33	3.25
10. Geographe	17.33	8.22
11. Greta	10.33	4.86
12. Katahdin	21.67	9.17
13. Kennebec	19.67	10.59
14. Maris Peer	20.67	1.37
15. Monona	14.33	1.19
16. Netted Gem	3.33	0.45
17. Nooksack	27.33	7.96
18. Norcheif	0.00	0.03
19. Norland	19.67	4.71
20. Pontiac	15.67	10.67
21. Record	2.33	0.18
22. Sebago	15.00	6.45
23. Up-to-date	9.67	3.84
24. 8120/5	1.67	0.10
25. 84-3 x 33-1	26.67	2.03
26. 5117	7.33	2.94
27. Superior	22.33	4.00
5% L.S.D.	7.184	4.839

84MD37, 84PE32,33 Incidence of soft rot Erwinia in potato/cauliflower rotations.

AIM

To monitor the level of stem soft rot and/or blackleg in commercially grown potato crops and identify the bacteria responsible.

MATERIALS AND METHODS

Two commercial sites and a site at the Medina Vegetable Research Station where potatoes and cauliflowers had been grown for at least the last three years and the potato varieties Delaware and Sebago were to be grown in the 1984 season, were chosen. Delaware is the most widely grown potato variety and is considered by advisers to be field tolerant to soft rot Erwinia whereas Sebago is one of the major processing varieties grown and is traditionally considered to be very susceptible to soft rot Erwinia. Monitoring both varieties at three sites proved an opportunity for assessment of their relative field performance. Furthermore, soft rot of cauliflowers due to E. carotovora ssp carotovora does cause problems from time to time and the risk of disease in potato crops due to disease carryover from cauliflower crops has not been assessed.

Areas 50 m x 6 m were randomly selected as test plots due to the impracticality of regularly assessing large areas of commercial plantings. These areas were monitored throughout the growing season by regularly assessing plant numbers of plants showing symptoms. Samples of plants and soil were assayed for presence and identity of Erwinia soft rot bacteria.

Table 5. Incidence of soft rot Erwinia during crop growth.

SITE	MEDINA		JANDAKOT		WANNEROO	
Potato variety	Sebago	Delaware	Sebago	Delaware	Sebago	Delaware
Soil pH	7.2	7.2	5.6	5.4	5.7	5.8
Mean (plants/m row) Emergence	7.4	6.7	6.1	6.3	6.0	5.5

PERCENTAGE OF DISEASED PLANTS AT EACH SAMPLE TIME

TIME	MEDINA		JANDAKOT		WANNEROO	
23.09.84	2.3	5.8	0.0	1.8	0.0	0.0
02.10.84	5.8	0.0	0.0	0.0	1.7	0.0
08.10.84	6.3	3.6	0.0	0.0	4.0	4.0
15.10.84	3.6	0.0	0.0	2.0	8.7	2.3
22.10.84	11.1	7.4	2.0	1.8	15.2	20.4
29.10.84			3.8	3.6	30.2	71.4
05.11.84			6.8		42.4	
12.11.84			30.0			
19.11.84			42.2			

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RESULTS AND DISCUSSION

No blackleg was detected in either variety at any site. Stem soft rot was detected at low levels from the stage of crops covering between rows and increased towards crop maturity (Table 5). E. carotovora ssp carotovora was the most commonly isolated soft rot Erwinia from all three sites, both potato varieties, random stems and stems showing symptoms, and from soil. One isolate of E. carotovora ssp atroseptica was isolateed from soil at Medina and this may have been due to the sample site being adjacent to an inoculated soft rot Erwinia variety experiment. One isolate of E. chrysanthemi was isolated from the following:- soil from Medina, sebago plant and Jandakot, soil from Jandakot, soil from Wanneroo.

Disease was not considered to be severe at any of the sites sampled, the high levels of stem soft rot affected stems occurred when crops were mature and plants were senescing. This does not appear to be a limiting factor to productivity under growing conditions in the metro area. However, earlier infections with stem soft rot could shorten crop life and considerably reduce yield. This situation has occurred in summer grown cros in the Donnybrook area where crops maturing in April have senesced early due to high levels of stem soft rot.

Erwinia isolates from these three sites and from a range of metro crops sampled towards maturity are now being tested for pathogenicity. It is concluded that while soft rot Erwinia species are widespread and readily detected in potato growing areas in metropolitan sands, disease symptoms (of blackleg or stem soft rot) are not.

FIGURE 1.
RESPONSE OF POTATO VARIETIES TO
POWDERY SCAB.

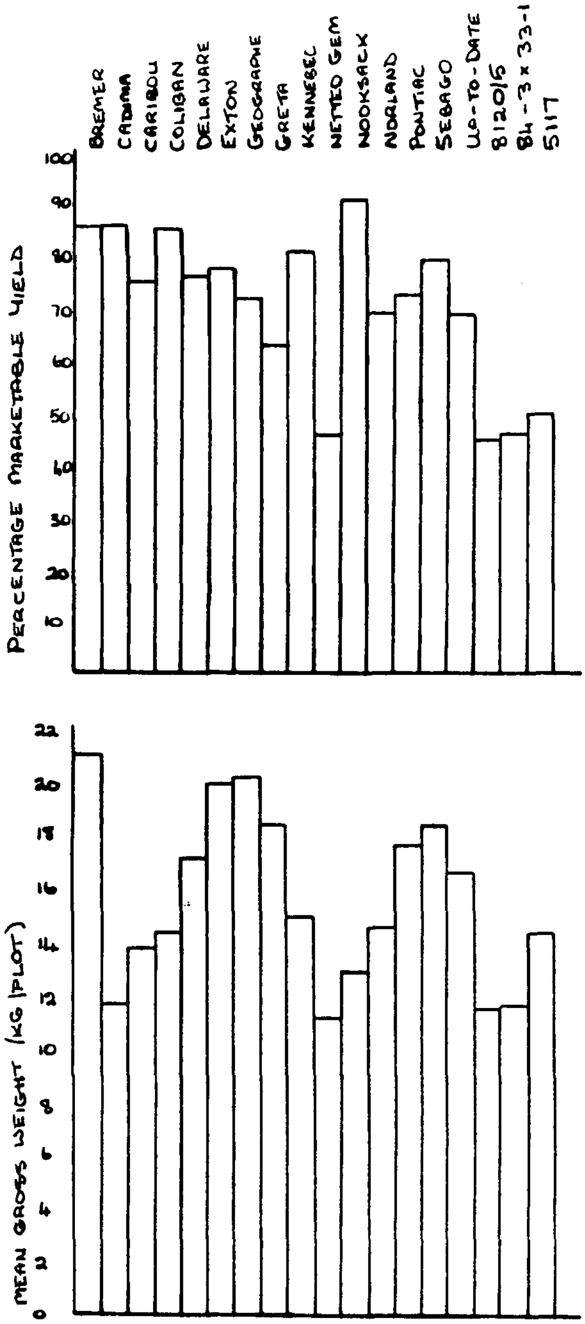
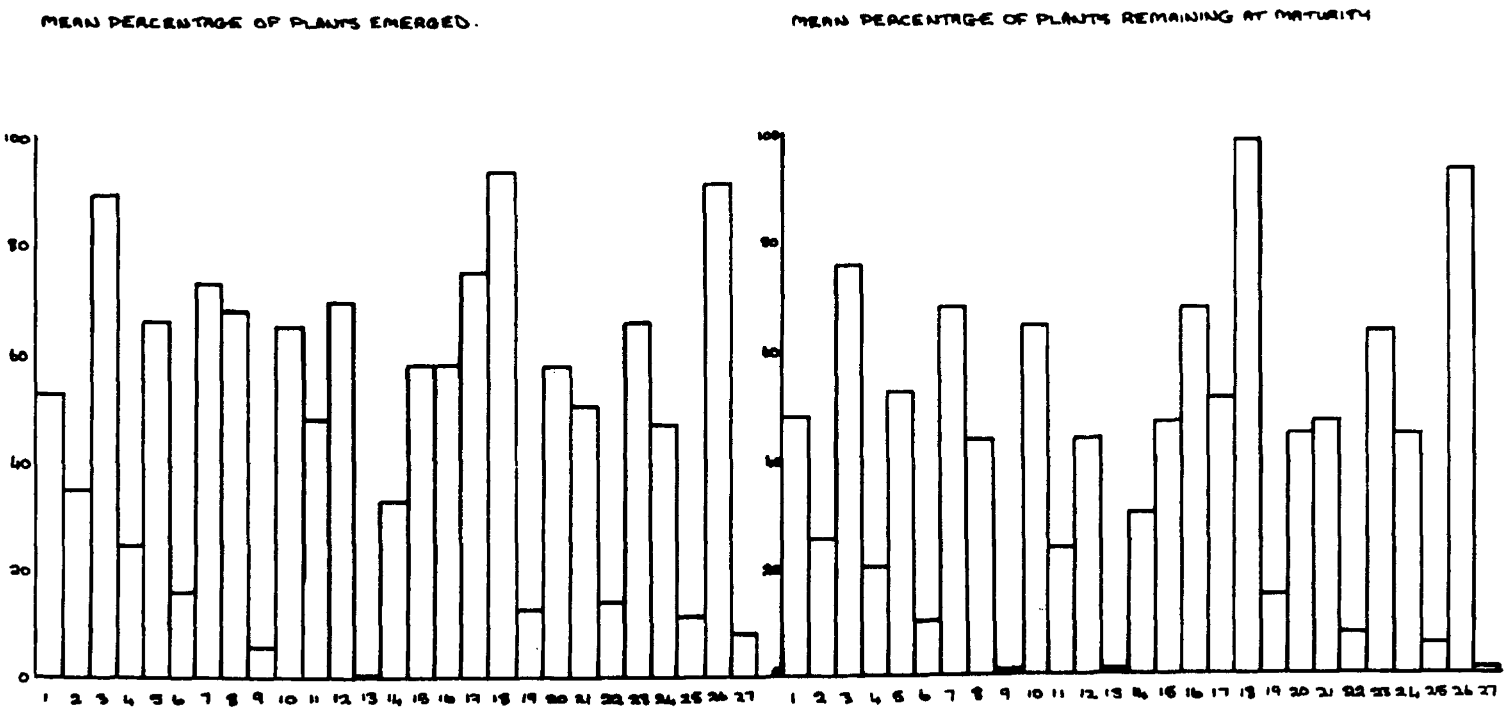


FIGURE 2

SUSCEPTIBILITY OF POTATO VARIETIES TO E.C.C. AND E.C.A. IN THE FIELD.

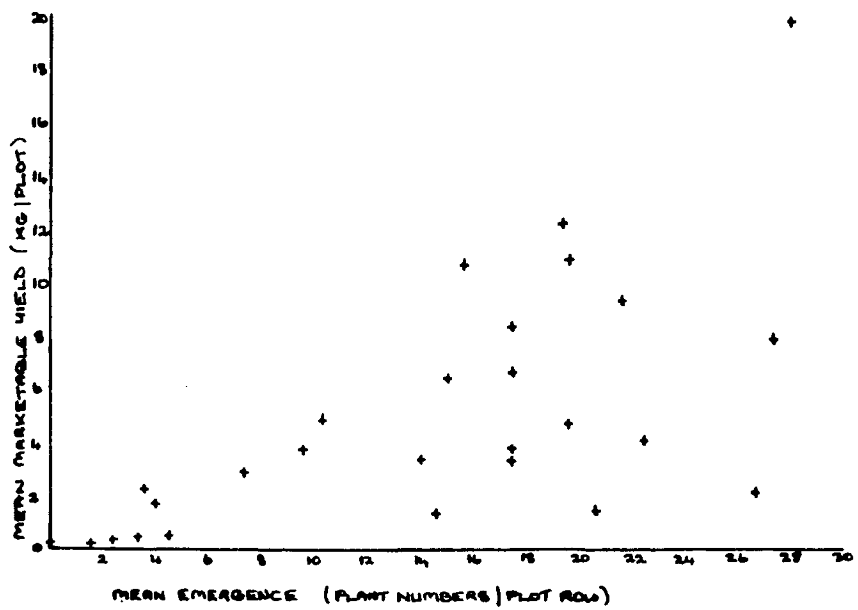


VARIETIES.

1 PONTIAC
2 GRETA
3 84-3 X33-1
4 5117
5 NORLAND
6 ALAMO
7 KATAHDIN
8 FUNDY
9 812015
10 ABANAKI
11 MONONA
12 MARIS PEER
13 NORCHEIF
14 UP-TO-DATE
15 GEOGRAPHE
16 EXTON
17 SUPERIOR
18 BREMER
19 CADIMA
20 COLIBAN
21 SEBAGO
22 DELAWARE
23 KENNEBEC
24 CARIBOU
25 NETTED GEM
26 NOOKSACK
27 RECORD

FIGURE 3

RELATIONSHIP BETWEEN PLANT COUNTS AND YIELD



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